



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ARSENIC**

CAS Number: 7440-38-2

DOT Number: UN 1558

RTK Substance number: 0152

Date: June 1992

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HAZARD SUMMARY

- * **Arsenic** can affect you when breathed in and may enter through the skin.
- * **Arsenic** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- * **Arsenic** can cause reproductive damage. Handle with extreme caution.
- * Skin contact can cause irritation, burning, itching, thickening and color changes.
- * Eye contact can cause irritation and burns.
- * Breathing **Arsenic** can irritate the nose and throat.
- * Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose.
- * High or repeated exposure can damage the nerves, with "pins and needles," burning, numbness, and weakness of arms and legs.
- * Repeated exposure can damage the liver and cause stomach problems.

IDENTIFICATION

Arsenic is a silver-gray or white metallic solid. It is used as an alloying agent for heavy metals, and in solders, medicines, and herbicides.

REASON FOR CITATION

- * **Arsenic** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, IARC, DOT, NTP, DEP, HHAG and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for *Inorganic Arsenic* (measured as *Arsenic*):

OSHA: The legal airborne permissible exposure limit (PEL) is **0.010 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.002 mg/m³** not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is **0.01 mg/m³** averaged over an 8-hour workshift.

- * **Arsenic** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * A regulated, marked area should be established where **Arsenic** is handled, used, or stored as required by the OSHA standard 1910.1018.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Arsenic** and upon exiting a regulated area.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Arsenic** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Arsenic**:

- * Skin contact can cause irritation, burning, itching and a rash.
- * Eye contact can cause irritation, burns, and red and watery eyes.
- * Breathing **Arsenic** can irritate the nose and throat.
- * High exposure can cause poor appetite, nausea, vomiting and muscle cramps.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Arsenic** and can last for months or years:

Cancer Hazard

- * **Arsenic** is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
- * Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- * There is limited evidence that **Arsenic** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

- * Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose. Hoarseness and sore eyes also occur.
- * High or repeated exposure can damage the nerves, with "pins and needles," burning, numbness, and weakness of arms and legs.
- * Repeated skin contact can cause thickening and color changes (patchy areas of darkening and loss of pigment). Some persons develop white lines on the nails.
- * Repeated exposure can damage the liver and cause stomach problems.

MEDICAL

Medical Testing

Before first exposure and every 6 to 12 months thereafter, OSHA 1910.1018 requires your employer to provide (for persons exposed to **0.005 mg/m³** of *Arsenic*) a medical history and exam which shall include:

- * Chest x-ray.
- * Exam of the nose, skin, and nails.

- * Sputum cytology examination.
- * Test for urine **Arsenic** (may not be accurate within 2 days of eating shellfish or fish; most accurate at the end of a workday). Levels should not be greater than **100 micrograms per gram** creatinine in the urine.
- * Exam of the nervous system.

After suspected overexposure, repeat these tests and consider complete blood count and liver function tests. Also, examine your skin periodically for abnormal growths. Skin cancer from **Arsenic** can be easily cured when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

- * Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Conditions Made Worse By Exposure

- * Many scientists believe that skin changes, such as thickening and pigment changes, make those skin areas more likely to develop skin cancer.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA standard: 29 CFR 1910.1018.
- * A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Arsenic**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Arsenic** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Arsenic**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Arsenic**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Arsenic**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Arsenic** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- * Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- * When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Arsenic**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide pre-filters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- * If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Arsenic**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- * Where the potential exists for exposures over **0.002 mg/m³**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **5 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m³** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- * Prior to working with **Arsenic** you should be trained on its proper handling and storage.
- * A regulated, marked area should be established where **Arsenic** is handled, used, or stored.
- * **Arsenic** may react with ACIDS, ACTIVE METALS (such as IRON, ALUMINUM or ZINC), and HYDROGEN GAS releasing ARSINE, a very deadly gas.
- * **Arsenic** must be stored to avoid contact with BROMINE PENTAFLUORIDE and CHLORINE TRIFLUORIDE since violent reactions occur.
- * **Arsenic** is not compatible with HEAT, OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES), STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE), and BROMINE AZIDE.
- * Store in tightly closed containers in a cool well-ventilated area away from FOOD and AIR.

- * Sources of ignition, such as smoking and open flames, are prohibited where **Arsenic powders** or **dust** are used, handled, or stored in a manner that could create a potential fire or explosion hazard.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Should I be concerned if a chemical is a teratogen in animals?

A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

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The New Jersey State Department of Health and Senior Services, Occupational Disease and Injury Services offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-2202.

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DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

HANDLING AND STORAGE (See page 3)

In NJ, POISON INFORMATION 1-800-764-7661

Eye Contact

Skin Contact

Breathing

- * Remove the person from exposure.
- * Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- * Transfer promptly to a medical facility.

Antidotes and Special Procedures

* For severe poisoning BAL has been used. For milder poisoning Penicillamine (not penicillin) has been used, both with mixed success. Side effects occur with such treatment and it is NEVER a substitute for controlling exposure. It can only be done under strict medical care.

- * **Arsenic metal** is NONCOMBUSTIBLE, however, **Arsenic dust** can be FLAMMABLE when exposed to HEAT or FLAME.
- * Use dry chemical, CO₂, or foam extinguishers.
- * POISONOUS GASES ARE PRODUCED IN FIRE.
- * If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Arsenic** is spilled, take the following steps:

- * Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
- * Remove all ignition sources.
- * Cover spill with dry lime or soda ash and collect powdered material in a safe manner. Deposit in sealed containers.
- * Ventilate the area after clean-up is complete.
- * It may be necessary to contain and dispose of **Arsenic** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
- * If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

PHYSICAL DATA

Vapor Pressure: 1 mm Hg at 372°F (189°C)

Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:

Arsenic

Other Names:

Arsenicals; Colloidal Arsenic; Metallic Arsenic; Arsenia

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NEW JERSEY DEPARTMENT OF HEALTH AND
SENIOR SERVICES

Right to Know Program

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